Alternatives Analysis Technical Report
Appendix J: STORMWATER MANAGEMENT PLAN TECHNICAL MEMORANDUM

Red Line/Blue Line Connector Project

Boston,
Massachusetts

Massachusetts Department of Transportation
Boston, Massachusetts

March 2010

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1 Introduction

The Massachusetts Environmental Policy Act Certificate in response to the Environmental Notification Form for the Red Line/Blue Line Connector Project mandated that a Stormwater Management Plan be prepared for the project area. This Plan complies with the Massachusetts Stormwater Management Policy and the City of Boston's National Pollutant Discharge Elimination System permit. The following sections provide a description of the existing surface water and stormwater management conditions, summary of the proposed project alternatives, explanation of the construction and post-construction stormwater management methods, and narrative regarding the project's regulatory compliance.

1.1 Overview

The project is located in the West End of Downtown Boston. There are no natural surface water resources or water supply protection areas within the project corridor. Stormwater runoff is managed through a storm sewer system. The Charles River is located immediately west of the terminus of the project (the Charles/Massachusetts General Hospital (MGH) Massachusetts Bay Transportation Authority (MBTA) subway station. There are groundwater resources, but no drinking water resources within the project area. Groundwater resources are discussed in the Groundwater Management Plan Technical Memorandum. Impacts to the Charles River or to the stormwater management system within the project area are discussed in Sections 4 and 5 of this Stormwater Management Plan.

Surface waters are important natural resources that have a variety of uses including public drinking water supply, irrigation, industrial supply, and wildlife habitat. Water quality is determined by the amount and type of dissolved or suspended material that the water may contain. The quality of a surface water body is largely determined by the terrain and condition of its contributing watershed. Pollutant sources can include point sources, such as industrial discharges with high concentrations of chemicals, as well as non-point sources, such as stormwater runoff from farmland containing fertilizers and pesticides. The focus of this section is to

describe existing conditions of the receiving waters and stormwater management system and establishes the basis for evaluating impacts. The information presented in the following sections describes the surface receiving water adjacent to the project area, the Charles River. Information on the existing quality and usage of this resource is based on publicly accessible information, including the *Massachusetts Year 2008 Integrated List of Waters*.[1]

1.2 Regulatory Context

Surface water resources are protected under several state and federal laws and regulatory programs, including the federal Clean Water Act and the Massachusetts Clean Waters Act (MGL Chapter 21, §26-53). Other applicable rules, regulations, and guidance include the Massachusetts Wetlands Protection Act (MGL Chapter 131, §40) and Wetlands Protection Act Regulations (310 CMR 10.00), Massachusetts Public Waterfront Act (MGL Chapter 91) and Waterways Regulations (310 CMR 9.00), the Surface Water Quality Standards (314 CMR 4.00), the Waterways Regulations, the proposed Stormwater Management Regulations (314 CMR 21.00), and the Massachusetts Stormwater Management Handbook[2]. The Charles River is also regulated under MGL Chapter 91, which protects the public interest in non-tidal rivers such as the Charles. Applicable statutes and regulations are described in detail below.

1.2.1 U.S. Clean Water Act of 1977

Water quality must be addressed for compliance with the Federal Water Pollution Control Act, also known as the Clean Water Act (CWA), which provides the authority to the United States Environmental Protection Agency (EPA) to establish water quality standards (or to states to establish standards equal to or more stringent than EPA standards), to control discharges into surface and subsurface waters, to develop waste treatment management plans and practices, and to issue permits for dredging, filling, or discharging to a waterbody. It requires states to monitor and classify waterbodies, establish goals, and publish lists of monitoring and classification results. The CWA gives states the authority and responsibility to publish water quality standards.[3] Applicable programs of the CWA are described in the following paragraphs.

1 Massachusetts Department of Environmental Protection, Division of Watershed Management. *Massachusetts Year 2008 Integrated List of Waters*. December 2008.

2 Massachusetts Department of Environmental Protection. *Massachusetts Stormwater Handbook*. February 2008.

3 U.S. Code. Title 33, Chapter 26 – *Water Pollution Prevention and Control*. November 27, 2002.

1.2.1.1 National Pollutant Discharge Elimination System Permit

The National Pollutant Discharge Elimination System (NPDES) permit program, authorized by the Clean Water Act Section 402, controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Point sources are discrete conveyances such as pipes or man-made ditches. Industrial, municipal, and other facilities must obtain permits if their discharges report directly to surface waters. In most cases, the NPDES permit program is administered by authorized states. However, Massachusetts is not a delegated state therefore; the NPDES permit program is controlled by U.S. Environmental Protection Agency (EPA) Region 1. Phase I of the NPDES Stormwater Program (1990) addressed sources of stormwater runoff that had the greatest potential to negatively impact water quality and required permit coverage for stormwater discharges from:

- Medium and large municipal separate storm sewer systems (MS4s) with populations of 100,000 or more;
- Companies that fall with one of the eleven categories of industrial activity, which includes construction activity that disturbs five or more acres of land.

Discharges to the Charles River from the existing stormwater management system are primarily managed by the Boston Water and Sewer Commission (BWSC). However, some of the stormwater drainage infrastructure is combined with the sanitary sewer system, managed by the Massachusetts Water Resources Authority (MWRA). Both these entities have received NPDES Phase I permits (No. MA0103284 and MA 0101192, respectively), covering Combined Sewer Overflows (CSOs). CSOs occur during large storm events when the combined stormwater and sanitary sewer drainage system reaches capacity and discharges its flow into a receiving water (the Charles River) instead of a wastewater treatment plant. The MWRA and BWSC have also received variances from their NPDES requirements to eliminate CSO discharges. The variance authorizes limited Combined Sewer Overflow (CSO) discharges during wet weather events under a series of conditions including the completion of design, construction, and subsequent monitoring of CSO controls proposed in the MWRA's revised Long-Term Control Plan. Alterations to the stormwater system must meet the standards of these existing permits and variance requirements.

Phase II of the NPDES Stormwater Program (2003) applies to additional MS4s and construction sites disturbing equal to or greater than one acre, but less than five acres of land. The Red/Blue Line Connector project would require a NPDES Construction General Permit (CGP) under Phase II because the project would disturb over one acre of land. The CGP regulates erosion control, pollution prevention, and other stormwater management issues at construction sites over 1 acre. This permit would include a Stormwater Pollution Prevention Plan that would specify proper stormwater management procedures for any disturbed areas.

1.2.1.2 Section 303(d) of the CWA

Section 303(d) of the CWA also establishes the Total Maximum Daily Load (TMDL) program, which is managed by the Massachusetts Department of Environmental Policy (DEP). DEP is mandated by Section 303(d) to maintain the Massachusetts Integrated List of Waters.

A TMDL is the allowable load of a single pollutant within a designated portion of a waterbody, from all point and non-point sources to the waterbody. Under the TMDL program, states establish priority rankings for their waterbodies and identify the uses for these waterbodies (e.g., drinking water supply, recreation, etc.). TMDLs can then be set for individual pollutants to ensure that the quality is adequate for the designated uses. Waterbodies with ongoing impairments may require a TMDL for a given contaminant. TMDLs identify the major contributors to a given impairment (e.g., sources within a watershed that may contribute to the contamination or impairment) and specifies both general and individual discharge limits that must be met in order to reduce contaminant loading and improve the health of the waterbody. TMDLs are first developed in draft form and must be approved by EPA in order to be implemented. If the EPA disapproves a TMDL, it must set the TMDL itself. If a project impacts a TMDL-listed waterbody, appropriate measures must be taken to control the discharge of the listed pollutant and meet the TMDL requirements. Some TMDLs may require additional stormwater treatment or other preventative measures in order to prevent an increase in pollutant loading to the receiving water.

The Massachusetts Integrated List of Waters identifies what designated uses are attained, what impairments have been reported, and whether or not a TMDL has been prepared, if required.

To summarize these details, the Massachusetts Integrated List of Waters divides waterbodies into various categories:

- Category 1 Waters: Waters attaining all designated uses.
- Category 2 Waters: Attaining some uses; other uses not assessed.
- Category 3 Waters: No uses assessed.
- Category 4a Waters: TMDL is completed.
- Category 4c Waters: Impairment not caused by a pollutant.
- Category 5 Waters: Waters requiring a TMDL.

The Lower Charles River Basin, between the Watertown Dam and the New Charles River Dam at Boston Harbor, is listed on the Massachusetts Integrated List as a Category 5 water, requiring a TMDL. Specifically, it is identified as an impaired or threatened waterbody for one or more uses, and requires TMDLs for nutrients and

pathogens. The *Total Maximum Daily Load for Nutrients in the Lower Charles River Basin, Massachusetts CN 301.0*[4] was finalized in June 2007, and the *Final Pathogen TMDL for the Charles River Watershed*[5] in January 2007. Table 1-1 shows the total phosphorous TMDL limits and Table 1-2 shows the pathogen limits for the Lower Charles River Watershed.

Stormwater discharges resulting from the project must be treated in accordance with the proposed Massachusetts Stormwater Regulations regarding TMDL pollutant reductions.

Table 1-1 Total Phosphorus TMDL for the Lower Charles River[4]

Source	Existing Load (1998-2002) (kg/year)	WLA (kg/year)	LA (kg/year)	TMDL (kg/year)	% Reduction
Upstream Watershed at Watertown Dam	28,925	15,109	0	15,109	48
CSOs	2,263	90[c]	0	90[c]	96
Stony Brook Watershed	5,123	1,950	0	1,950	62
Muddy River Watershed	1,549	590	0	590	62
Laundry Brook Watershed	409	155	0	155	62
Faneuil Brook Watershed	326	125	0	125	62
Other Drainage Areas	1,455	550	0	550	62
Explicit Margin of Safety	-	-	-	979	
TOTAL	40,050	18,565	0	19,544	54

Table 1-2 Pathogen TMDL for the Lower Charles River

Segment No.	Location	Drainage	Low Flow 90% of all flows are greater than	Median 50% of all flows are greater than	High Flow 10%of all flows are greater than	TOTAL MAXIMUM ALLOWABLE DAILY BACTERIA LOADS AS DAILY NUMBER OF FECAL COLIFORM (Number of Bacteria per day based on % Flow Exceedance)		
		sq mi	DAILY CFS	DAILY CFS	DAILY CFS	Low Flow -90%	Median Flow -50%	High Flow-10%
MA72-07	Watertown Dam	37.13	8.5	42.6	139.0	4.17E+10	2.09E+11	6.80E+11
MA72-08	Sci. Museum	50.44	11.6	57.9	188.8	5.67E+10	2.83E+11	9.24E+11
MA72-30	Laundry Brook	37.15	8.5	42.6	139.1	4.17E+10	2.09E+11	6.81E+11

[4] Massachusetts Department of Environmental Protection and United States Environmental Protection Agency, New England Region. *Total Maximum Daily Load for Nutrients in the Lower Charles River Basin, Massachusetts CN 301.0*. June 2007.

[5] Massachusetts DEP and United USEPA New England Region 1. *Final Pathogen TMDL for the Charles River Watershed*. January 2007.

MA72-11	Muddy R.	1.93	0.4	2.2	7.2	2.17E+09	1.08E+10	3.54E+10

1.2.2 Massachusetts Surface Water Quality Standards

The Massachusetts Surface Water Quality Standards (314 CMR 4.00) designate the most sensitive uses for the state's surface waterbodies in order to enhance, maintain and protect water quality in these waters. The Standards stipulate minimum water quality criteria required to sustain designated uses; and contain regulations necessary to achieve these uses and maintain existing water quality. The Standards assign class designations to inland and coastal waters. These classes specify water quality standards based on the intended uses of the waterbodies. The standards for each class can address characteristics such as temperature, Dissolved Oxygen (DO), pH, bacteria, solids, color and turbidity, oil and grease, and taste and odor. For the purposes of this project, which only include adjacent inland waters, details regarding these classifications are provided, as follows:

- Class A Waters: Designated as sources of public drinking water supply, as excellent fish and wildlife habitat, and for primary and secondary contact recreational activities. The standards for contact recreation must be met for Class A waters even if these activities are not permitted (e.g., in a reservoir). Class A waters also have excellent aesthetic value. This is the most stringent inland water classification and includes strict standards for bacteria, DO, and other characteristics to protect the designated uses of the water and human health.
- Class B Waters: Designated for primary and secondary contact recreational activities and for fish and wildlife habitat. Class B waters are suitable for compatible industrial processes and cooling, irrigation, and other agricultural uses. Class B waters also have consistently good aesthetic value. Some Class B waters are designated as suitable for public water supply with appropriate treatment.
- Class C Waters: Designated for secondary contact recreational activities and for fish and wildlife habitat. Class C waters are suitable for compatible industrial processes and cooling and for irrigation of crops that are intended for cooking before consumption. Class C waters also have good aesthetic value. This is the least stringent inland water classification.

The Charles River is classified as a warm water fishery, Class B inland water that is impacted by the discharge of combined sewer overflows. Specific pollutant limitations for the Charles River (and any Class B waters) include, but are not limited to:

- DO: > 5.0 mg/l. (Where natural background conditions are lower, DO shall not be less than natural background conditions.)
- Temperature: < 83°F (28.3°C). (Based on the mean of the daily maximum temperature over a seven day period, unless naturally occurring, and rise in temperature due to a discharge shall not exceed 5°F (2.8°C).)
- pH: 6.5 - 8.3 standard units. (Not to exceed 0.5 standard units outside of the natural background range.)
- Bacteria:
  - E. coli Indicator: geometric mean < 126 colonies per 100 ml. (Minimum of five samples within most recent six months and no single sample shall exceed 235 colonies per 100 ml)
  - Enterococci Indicator: geometric mean < 33 colonies per 100 ml. (Minimum of five samples taken within the most recent six months and no single sample shall exceed 61 colonies per 100 ml.)
  - Solids: Zero floating, suspended and settleable solids.
- Color and Turbidity: None.
- Oil and Grease: None.
- Taste and Odor. None.

1.2.3 Massachusetts Wetlands Protection Act and Stormwater Management Standards

Stormwater from the proposed project would likely discharge to resource areas regulated under the Massachusetts WPA (310 CMR 10.5(6)(k). Projects that fall under the jurisdiction of the WPA must comply with the 2008 Massachusetts Stormwater Management Standards referenced in the WPA regulations. The Stormwater Management Standards define the requirements for proper stormwater management for new or re-development sites in the Commonwealth of Massachusetts. The water quality issues addressed by the standards include erosion control, peak discharge rates, ground water recharge, total suspended solids (TSS) removal, wellhead protection, construction management, long-term maintenance, and illicit (non-stormwater) discharges to the stormwater management system. Additional stormwater regulations (314 CMR 21.00) proposed by the DEP, are due to be finalized in early 2010, apply treatment requirements to projects in TMDL areas, impose restrictions on discharges to water supply protection areas, require infiltration to offset the effects of impervious surfaces on runoff and ground water recharge, and create a statewide permit program administered by DEP.

1.2.4 City of Boston Groundwater Protection Overlay District

The western portion of the proposed project area is located within the City of Boston's Groundwater Protection Overlay District (Article 32 of the Boston Zoning Code). The ordinance regulates the portion of the project area from Storrow Drive eastward, along Cambridge Street to Grove Street, and southward towards Beacon Hill. It calls for the infiltration of no less than 1.0 inches of rainfall across impervious surfaces and the use of "groundwater-retaining paving" for projects that require a building permit from the City. The recharge requirement is slightly more stringent than the Massachusetts Stormwater Standards for recharge, which vary by soil type. The proposed project must comply with the provisions of the ordinance's recharge requirements where repaving of impervious surfaces is necessary due to project construction.

2

Existing Conditions

The project site is located within the West End of Downtown Boston, an urban sector of the City. There are no surface water resources within the project area. However, the Charles River is west of the terminus of the project and receives stormwater discharges from the Cambridge Street corridor. Boston Harbor is approximately 0.4 miles east of the existing Bowdoin Station and there are no existing stormwater discharges to this resource from Cambridge Street.

2.1 Surface Water Resources

The Charles River begins in Hopkinton, Massachusetts and continues through thirty-five cities and towns before it reaches Boston Harbor at the Charles River Dam in Boston. Approximately 80 brooks and streams and several major aquifers feed the Charles River. The river is very slow-moving, thereby keeping its sediment base reasonably intact. The segment of the river to which the Cambridge Street corridor stormwater discharges is the Lower Charles River Basin, between the Boston University Bridge and the New Charles River Dam at the confluence of Boston Harbor.

According to the Massachusetts Surface Water Standards, the Lower Charles River Basin is classified as a warm water fishery, Class B inland water that is impacted by the discharge of CSOs. When CSO discharges occur, the Massachusetts Water Quality Standards for swimming and contact recreation are violated. Class B waters are designated as a habitat for fish, other aquatic life, and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation.[6] Many of these impairments to the Charles River are attributable to stormwater pollution and remain the main impediment to realizing a fishable, swimmable river. The Charles River watershed is the most urbanized in Massachusetts, with 20 percent of the state's population, and highly impervious land cover.

6 Division of Water Pollution Control. 314 CMR 4.00 Massachusetts Surface Water Standards. January 2007.

According to the *Total Maximum Daily Load for Nutrients in the Lower Charles River Basin, Massachusetts,* the Lower Charles River is impaired due to the over abundance of pathogens and phosphorous in the watershed. Most of the watershed area surrounding the Lower Charles River is highly urbanized with extensive piped drainage systems. The major source categories of phosphorus to the Lower Charles River include end-of-pipe stormwater, illicit sanitary sewage discharges, and CSOs. There are relatively few to no overland sources of nutrient pollution that discharge directly to the Lower Charles River from the Cambridge Street Corridor.

2.2 Stormwater Management System

The stormwater management system within the Cambridge Street corridor project area is primarily an engineered system that collects stormwater runoff from impervious surfaces (city streets, sidewalks and often rooftops) and discharges it into the Charles River. The BWSC controls most of the stormwater system, however; some storm drains and outfalls are privately owned or are owned by agencies such as the Massachusetts Highway Department, the Massachusetts Turnpike Authority, Massport, and the Department of Conservation and Recreation.

In the City of Boston, including the Cambridge Street corridor, CSOs flow through a piped system carrying both sewage and stormwater to the MWRA Deer Island Wastewater treatment plant. According to studies conducted by the MWRA, the potential for a CSO discharge increases when the amount of rainfall exceeds 0.5 inches. Currently, Boston has approximately 235 miles of combined sewers and 37 active CSO outfalls. The entire Cambridge Street Corridor is comprised of one drainage area that discharges to one CSO outfall along the Charles River: MWR 022. This is the location where stormwater flows from the project area enters the Charles River (Figure 1) in large storm events. Otherwise, stormwater continues to flow along the combined stormwater/sewer system to the Deer Island treatment plant where it is treated to a secondary treatment level and discharged to Massachusetts Bay. This outfall is located within the Esplanade Park, along the east bank, approximately 370 feet north of the Longfellow Bridge. Aside from the use of catch basins to collect sediments and total suspended solids, there are no other treatment elements within the BWSC stormwater management system for the drainage area.

According to current Massachusetts Geographic Information Systems (MassGIS) and BWSC data, there is no stormwater infrastructure at the Bowdoin T station or adjacent Cardinal Cushing Park (Figure 1). However, there is extensive stormwater infrastructure along Cambridge Street corridor that may be altered by the project.

Approximately 1,605 linear feet of stormwater infrastructure runs from 131 to 315 Cambridge Street along the north side of the corridor, starting at the Staniford Street intersection. Stormwater drainage pipes begin at this intersection and run east to west to where they divert to the combined system along the south side of

Cambridge Street (approximately at 161 Cambridge Street; the South Russell Street intersection). A new series of stormwater drainage pipes begin at this intersection and run east to west converging with the combined system at Blossom Street (Figure 2). Portions of the system continue along Cambridge Street, joining the combined sewer system at the North Grove Street intersection. The stormwater drainage system along the south side of Cambridge Street consists of 633 linear feet of infrastructure running east to west to the Cambridge Street combined system (from 100 to 204 Cambridge Street) and 164 linear feet of drainage running west to east connecting with the combined drainage infrastructure at North Grove Street. On the west side of the project area, stormwater infrastructure begins with drainage piping that follows the south side of the Charles/MGH station starting at West Cedar Street, flowing west towards the Charles Street combined sewer system (Figure 2).

The combined sewerage system infrastructure within the project area originates at the intersection with Temple Street and runs the entire south side of Cambridge Street, past the Charles MGH Station, and then shifts north towards Boston Harbor. There is a CSO pipe underneath the Massachusetts Eye and Ear overflow parking area (between Storrow Drive East and Charles Street - north) that diverts sewerage and stormwater flows from the combined sewer drainage system during large storms to the MWR 022 outfall. During dry weather and smaller storms, stormwater flows continue to the Deer Island treatment plant, as discussed previously.

2.3 Water Quality

BWSC monitored stormwater quality in drainage areas representative of high density residential and mixed land uses between spring 2001 and fall 2004.[7] Based on the data generated under the representative stormwater monitoring programs, the following general conclusions were made by BWSC:

- Bacterial levels in stormwater consistently exceed applicable water quality standards, particularly those based on fecal coliform concentration, even in areas known to have no illegal sanitary connections.
- Levels of copper and zinc in runoff from the Boston area consistently exceed applicable water quality criteria, particularly in dissolved form. The metals occur primarily in dissolved form, suggesting that conventional BMPs aimed at solids control would be ineffective at addressing metals toxicity.
- Drainage areas with more pavement and associated automobile traffic (e.g. commercial, high-density residential and mixed use areas such as Cambridge

[7] Boston Water and Sewer Commission, *2008 Stormwater Management Report.*

Street) generally had higher levels of solids, heavy metals, oil & grease, and/or TPH.

Only minor changes to the BWSC system along Cambridge Street have been made throughout the past decade; therefore, these assumptions made regarding pollutants in Boston stormwater are still valid. Bacteria and phosphorous exceedances have also been confirmed by water quality studies conducted by the Charles River Watershed Association (CRWA).[8] In 2008, monitoring at the Longfellow Bridge CSO area resulted in phosphorus levels well above the EPA recommended criterion of 0.0238 milligrams per liter (0.06 mg/L). The CRWA 2008 water quality report showed that samples taken at this CSO met bacteria standards only 27 percent of the time during wet weather (during CSO events).

[8] Charles River Watershed Association, *Charles River Monthly Monitoring Program; 2008 Year-End Report*, August, 2009.

3 Project Description

3.1 Introduction

The Red Line/Blue Line Connector Project would consist of a construction phase, during which the Blue Line extension from the Bowdoin to the Charles/MGH Station would be built, and the operational phase, during which the Blue Line trains would continue past the current Bowdoin Station to the Charles/MGH Station.

As described in the Definition of Alternatives Report,[9] the Build Alternatives under consideration include eliminating or relocating the underground portions of Bowdoin Station. The current configuration of Bowdoin Station does not facilitate an extension to the Charles/MGH Station, and it would require relocating one platform to accommodate longer (six car) trains for the extended service. However, few passengers board Blue Line trains at Bowdoin Station compared to the nearby Government Center Station. Accordingly, eliminating the station is one alternative for the Project. In any case, there would not be any new stations constructed for the Project. A new underground platform for the Blue Line would be constructed adjacent to the existing Charles/MGH Station headhouse and elevated platform, at a lower elevation, for the Red Line. Connections between the two platform levels would be made via stairways, escalators and elevators.

There are no location or construction alternatives. A cut-and-cover construction method for the entire Project was initially considered but was determined to result in excessive cost and traffic disruption along Cambridge Street between Bowdoin Station and Charles/MGH Station. This construction method is therefore considered infeasible for this segment; further analysis of this method was not completed. Cut-and-cover construction would be used for a short (800-foot long) segment east of Bowdoin Station and for the two tail tracks west of the Charles/MGH Station.

9 EOT. 2009. *Red Line-Blue Line Connector Project- Definition of Alternatives Report*. Commonwealth of Massachusetts, Executive Office of Transportation and Public Works. Prepared by Vanasse Hangen Brustlin, Inc.: Boston.

The following sections describe the potential adverse or beneficial impacts to environmental justice populations that would result from the Build Alternatives and the construction activities. The No-Build Alternative is also described, as a baseline condition to which the operational alternatives may be compared.

3.2 No-Build Alternative

Under the No-Build Alternative, it is assumed that Blue Line operations would remain similar to currents operations with the exception of implementing the following infrastructure improvements proposed in the MBTA's long range transportation plan, Program for Mass Transportation.[10] No permanent or temporary changes to the existing BWSC stormwater management system are proposed.

3.3 Build Alternatives

The two Build Alternatives that have been developed for the project involve a predominantly mined tunnel in combination with a relatively short section of tunnel constructed using the cut-and-cover construction technique. Alternative 1 and Alternative 2 are essentially the same except that Alternative 2 includes construction of a new Bowdoin Station to replace the existing station, while Alternative 1 would eliminate the existing Bowdoin Station. The proposed tunnel geometry accommodates the following design requirements:

- Maximum length of tunnel constructed by mining to limit traffic disruption and utility relocation;
- Space to park four trains at the proposed Charles/MGH Blue Line Station each night;
- Inclusion of a cross-over track near the Charles/MGH Blue Line Station;
- Off-street location of primary access shaft and staging areas; and
- Tunnel mined at depth that is constructible and balances cost, commuter convenience, and surface settlement.

To allow for smooth transit operations and the storage of extra trains, Alternatives 1 and 2 both include construction of two tail tracks west of the proposed Charles/MGH Blue Line Station. These tunnel segments will be constructed using the Sequential Excavation Method (SEM). The SEM is a tunneling method that allows for the progressive construction of a tunnel opening by excavating areas only as large

10 MBTA. 2009. *Capital Investment Program, FY 2010-2014*. Available on-line at: http://www.mbta.com/uploadedfiles/About_the_T/Financials/MBTA%20FY10-FY14%20CIP.pdf. Accessed 2 November 2009.

as the soil can support (with reinforcement where required) prior to the installation of structural supports and shotcrete. In some areas of the project, it is anticipated that extensive soil improvement, and/or grouting will be required to mine using SEM. Major components of the proposed Alternative 1 tunnel include:

- Access shafts;
- Tunnel segments mined using SEM;
- Tunnel segments mined using an Earth Pressure Balance Tunnel Boring Machine (TBM);
- Station platform construction using SEM;
- Cross-over construction using SEM; and
- Tunnel segments constructed by the cut-and-cover method.

In addition to the major tunnel components, minor ventilation shafts, a separate fan room structure, emergency egress stairways, station connections, and underpinning are required for each of the tunnel alternatives.

No new impervious surfaces are proposed, which eliminates the potential for new stormwater-related impairment to the Charles River. However, there will be temporary impacts to the existing stormwater system from construction, which include use of temporary alterations to the stormwater infrastructure and dewatering discharges to the stormdrain system.

Major components of the proposed Alternative 2 tunnel are the same as for Alternative 1 except that Alternative 2 includes construction of a new Bowdoin Station.

3.3.1 Alternative 1: Eliminate Bowdoin Station

This Alternative would eliminate the existing Bowdoin Station. The station would be decommissioned or demolished. Riders would use the Government Center Station, about 1,000 feet to the east, or the new station at Charles/MGH, about 2,000 feet to the west, to access the Blue Line or Red Line. The Bowdoin Station headhouse at Cardinal Cushing Park would be retained for use as emergency egress from the subway.

At this stage in the conceptual design process, permanent changes to the stormwater drainage system are not anticipated. No additional drainage to the stormwater or sanitary sewer system, on a permanent basis, would occur therefore, there will be no additional stormwater flows to the Charles River or Deer Island Treatment Plant.

3.3.2 Alternative 2: Relocate Bowdoin Station

This Alternative would relocate the inbound platform of Bowdoin Station while maintaining the existing mezzanine and headhouse. Under this scheme, Bowdoin Station would be able to accommodate six-car trains, improving the ridership capacity from this site. Access to the platforms from the headhouse would be made via ADA-compatible escalators, elevators and stairway connections. It is assumed that the hours of operation and frequencies on the Blue Line would remain unchanged under this alternative, except the hours of operation at the Bowdoin Station would be expanded to match the other Blue Line stations.

No permanent changes to the stormwater drainage system would occur. Additional drainage on a permanent basis to the stormwater or sanitary sewer system is not proposed, therefore; there will be no additional stormwater flows to the Charles River or Deer Island Treatment Plant.

3.4 Construction Activities

The tunnels for the Blue Line extension under Cambridge Street west of the Bowdoin Station would be constructed by a horizontal boring machine. This machine would bore the two (in-bound and out-bound) tunnels beneath existing infrastructure. Except at access points at either end of the alignment, all work along this segment would be completed below grade. Surface disturbance would be limited; any required detours would be scheduled at night or on weekends, rather than during weekday work hours. East of Bowdoin Station, for approximately 800 feet, cut-and-cover construction would be used to realign the existing tracks from Government Station. Traffic would not need to be detoured along this section of Cambridge Street during the construction period however, the area of excavation will be decked overExcavation may also be used to construct the short tail tracks immediately west of the Charles/MGH Station. The open trenches would be covered with traffic decking when possible.

A staging area, tentatively established as a portion of the Massachusetts Eye and Ear Infirmary parking lot immediately north of the Charles/MGH Station, would be the main access point. A second access point would be established at the Bowdoin Station to allow for removal of the boring machine. Both Alternatives include new subsurface platforms to be added to the Charles/MGH Station for the extended Blue Line.

Temporary relocation of portions of the existing BWSC drainage system may be necessary during construction. Temporary perforated stormwater drainage piping will be inserted along the drainage system in areas where existing piping will need to be temporarily removed. However, the Massachusetts Department of Transportation (DOT) intends to restore all elements of Cambridge Street, including stormwater infrastructure, to pre-construction conditions.

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4

Construction Period Management

Temporary impacts to the existing stormwater system would occur during construction, which include use of temporary alterations to the stormwater infrastructure and dewatering discharges to the stormdrain system. This analysis focuses on evaluating these temporary construction impacts to the existing stormwater system. This Chapter describes the proposed sedimentation and erosion control measures for both Build Alternatives during construction as well as groundwater treatment and dewatering methods.

Groundwater dewatering would be necessary during construction due to the high water table. As described in the Hazardous Materials Technical Memorandum[11] and Groundwater Management Plan[12], groundwater in most of the project area is expected to be contaminated from leaks and seepage from historic underground storage tanks, which will need to be treated prior to discharge and/or infiltration.

4.1 Stormwater Generation

There will be no new impervious surfaces created from the Build Alternatives and therefore no new stormwater conveyances. However, the existing stormwater management system will be altered during construction to accommodate the mine-tunnel approach. Some of the stormwater drainage piping would be temporarily relocated during construction as the tunnel mining moves forward. The drainage system would be reconstructed upon completion of each phase of construction.

[11] Massachusetts Department of Transportation. *Hazardous Materials Inspection Technical Memorandum*. September 2009.

[12] Massachusetts Department of Transportation. *Groundwater Management Plan*. October 2009.

4.2 Stormwater Pollutant Sources

No new impervious area would be created by the project therefore, pollutants typically generated upon new roadway surfaces would not increase (sediments, metals [copper, zinc, lead, arsenic]; phosphorous, bacteria and nutrients from animal waste; and oil and grease). Sedimentation associated with exposed soils during the cut and cover construction phase, if untreated, could create negative impacts on the environment:

- A decrease in visibility and increase in turbidity for aquatic organisms, making it difficult for these organisms to capture prey;
- A decrease in light availability for photosynthetic organisms;
- Closing of gills in fish and aquatic species;
- Reduction in spawning of fish and general surviva;
- Increase in the transportation of heavy metals, phosphorous and other pollutants through waterways as they attach to the sediment particles and harm water quality.

In addition, soil within the Charles Circle area is reportedly contaminated with Extractable Petroleum Hydrocarbons (EPH), Lead, and polycyclic aromatic hydrocarbons (PAHs). According to DEP regulatory files, approximately 95,480 square feet of contaminated soil lies within the Project's limit of work boundaries. Therefore, soil stockpiles removed from the mined tunnel would need to be disposed of according to DEP's Interim Remediation Waste Management Policy for Petroleum Contaminated Soils (#WSC-94-400), based on new regulations for remediation waste management in the Massachusetts Contingency Plan (310 CMR 40.0030) and the Massachusetts Hazardous Waste Regulations (310 CMR 30.252(2)). Stormwater management measures to prevent soil sedimentation from entering the BWSC stormwater drainage system are described in the following section.

Dewatered groundwater in the project area is expected to have been contaminated by oil spills throughout the history of the corridor. Specifically, the presence of petroleum-based fuels such as gasoline and diesel are expected to be found within the groundwater under Cambridge Street. According to the Groundwater Management Plan, these releases have contaminated the shallow groundwater locally. Groundwater quality of the deeper formations is uncertain. Management of contaminated dewatered groundwater is described in Section 4.4.

4.3 Stormwater Management

In order to comply with the Massachusetts Stormwater Standard 8 (control of construction-related impacts) and the National Pollutant Discharge Elimination System Construction General Permit (CGP), MassDOT will develop a Stormwater Pollution Prevention Plan (SWPPP). This plan will describe the sediment and erosion control measures that will be put in place during construction. The general goals of the SWPPP are:

- Erosion Control:
  - Control stormwater flowing onto and through the project;
  - Stabilize soils promptly;
  - Protect slopes;
- Sediment Control:
  - Protect storm drain inlets;
  - Establish perimeter controls;
  - Retain sediment on-site and control dewatering practices;
  - Establish stabilized construction exits; and
  - Inspect and maintain controls.

Key elements of the SWPPP are briefly described below.

4.3.1 Erosion Control Measures

Soils in the project area generally consist of miscellaneous fill, organic (tidal) silt, marine clay, marine sand, and glacial till (see Subsurface Soil Excavation Technical Memo[13]). Due to the highly urbanized nature of the project area and mined construction methodology, there would not be any soil sloping. Exposed soils will be located within the cut and cover construction areas, which serve as detention basins during rainfall events. Furthermore, exposed soils will be stabilized throughout the project area, where necessary, using permeation grouting. For example, the South

[13] Massachusetts Department of Transportation. *Geotechnical Interpretive Report Technical Memorandum*. October 2009.

Tail Track Tunnel will be advanced through both marine clay and glacial till. Permeation grouting of the glacial till from within the tunnel as the tunnel advances will likely be required to reduce groundwater inflow and to prevent softening of exposed glacial till surfaces associated with excessive seepage or heave of a clay subgrade due to hydrostatic uplift pressures in the underlying glacial till.

Outlet protective/velocity dissipation devices are required by the CGP to be placed at existing discharge locations (MWR022 outfall) to provide a non-erosive flow velocity from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected. A joint agreement between MassDOT, BWCS, and MWRA must be initiated to implement this measure due to the joint ownership of drainage infrastructure. Outlet protection devices to be considered include rock, grouted riprap, or concrete rubble placed at the MWR 022 CSO outfall to prevent scour of the soil caused by high pipe flow velocities during construction and to absorb flow energy to produce non-erosive velocities.

4.3.2 Sediment Control Measures

Although unlikely, sedimentation from construction operations may be possible, primarily within the proposed cut-and-cover construction locations adjacent to Bowdoin and Charles/MGH Stations. Sediment control measures during construction of the Build Alternatives would include storm drain inlet protection, street sweeping, perimeter controls, stabilized construction entrances/exits, temporary sediment basins, and staging area management.

4.3.2.1 Storm Drain Inlet Protection

Storm drain inlet protection measures prevent soil and debris from entering storm drain drop inlets. These measures are temporary and would be implemented before the project site is disturbed. The type of filter used depends on the inlet type (for example, curb inlet, drop inlet), slope, and volume of flow.

The following types of inlet protection are under consideration for the project:

- *Fabric barriers around inlet entrances*: Erecting a barrier made of porous fabric around an inlet creates a shield against sediment while allowing water to flow into the drain. This barrier slows runoff while catching soil and other debris at the drain inlet.
- *Block and gravel protection*: Standard concrete blocks and gravel can be used to form a barrier to sediments that permits water runoff to flow through select blocks laid sideways.

Proprietary inlet filters would also be considered due to site constraints such as those are placed in front of or on top of an inlet or inside the inlet under the grate.

4.3.2.2 Street Sweeping

The City of Boston currently maintains a daily street sweeping schedule for long-term pollutant and sediment control. Pollutants, including sediment, debris, trash, road salt, and trace metals can be minimized by street sweeping. The City's cleaning occurs daily (a bi-monthly schedule covers each neighborhood) from April through November by contracted and City-owned mechanical sweepers. Nightly street sweeping along Cambridge Street during project construction could be negotiated through an agreement with MassDOT and the City of Boston.

4.3.2.3 Perimeter Controls

Silt fences to stop sediment from leaving the site would be considered in locations where the use of these devices would not impair pedestrian or vehicle access to businesses and residences. The use of these control measures may be useful adjacent to cut-and-cover construction locations to ensure that sediment transport does not occur. It would also create an appropriate pedestrian safety barrier.

4.3.2.4 Stabilized Construction Entrances/Exists

The purpose of stabilizing entrances to/exits from a construction site is to minimize the amount of sediment leaving the area as mud and sediment attached to vehicles.[14] Stabilizing the entrance/exit can improve both the appearance and the public perception of the construction project. Stabilized construction entrances/exits are commonly made of large crushed rock. Due to the highly urbanized nature of the corridor, it may not be possible to utilize this method. However, MassDOT would consider using a concrete pad or corrugated steel panels (rumble pad), if possible.

4.3.2.5 Sediment Basins and Rock Dams

Due to the urbanized site area, a temporary sediment basin or equivalent controls is not attainable however, smaller sediment basins and/or sediment traps are acceptable. Cut-and-cover locations will serve as temporary sediment basins during rainfall events.

[14] U.S. Environmental Protection Agency's Construction Site Stormwater Runoff Control Best Management Practices List (http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=min_measure&min_measure_id=4).

4.3.2.6 Staging Area Management

The proposed construction staging area is located within the Charles River Reservation, owned by the Department of Conservation and Recreation. Construction equipment and maintenance materials would be stored at the combined staging area and materials storage areas.

Hazardous waste materials such as oil filters, petroleum products, paint, and equipment maintenance fluids will be stored in structurally sound and sealed shipping containers, within the hazardous materials storage area. Hazardous waste materials will be stored in appropriate and clearly marked containers and segregated from other non-waste materials. Secondary containment will be provided for all waste materials in the hazardous materials storage area and will consist of commercially available spill pallets. Additionally, all hazardous waste materials will be disposed of in accordance with federal, state, and municipal regulations, as discussed further in the Hazardous Materials Technical Memorandum. All waste materials will be collected and disposed of into two metal trash dumpsters in the materials storage area. Dumpsters will have a secure watertight lid, be placed away from stormwater conveyances and drains, and meet all federal, state, and municipal regulations. Further details regarding these methods will be included in the SWPPP.

A small portion of the staging area is located within the FEMA flood zone therefore flood hazard protection is also required within this area. Gravel bag berms would be installed around the perimeter to designate the staging and materials storage area and protect the area from potential flooding. A watertight shipping container would be used to store smaller construction materials and tools.

4.4 Groundwater Dewatering

During the preliminary design phase, it was determined that project dewatering would be required. Dewatering practices are used to remove groundwater or accumulated rain water from excavated areas. Preliminary design calls for all of the access shafts and the cut-and-cover section of the tunnel to be constructed within excavation support systems that are relatively impervious. Therefore, the dewatering system will only be required to remove the water that is currently within the proposed excavation areas and seepage into the excavations and into tunnels.

At this preliminary design stage, the following dewatering system options are being explored:

- Dewater and recharge to the Massachusetts Contingency Plan (MCP) allowed areas (100 feet of the regulated contaminated site);
- Discharge to the MWRA Sanitary Sewer System, if possible;

- Apply for coverage under the NPDES Remediation General Permit for treatment of the groundwater prior to discharge to the stormdrain system or infiltration; or
- Dispose of dewatered groundwater off-site.

All options depend on dewatering flow calculations that are not currently available. The NPDES Remediation Permit would require treatment based on the quality of groundwater during the time of construction therefore, a sampling program just prior to construction, as well as during construction, to determine whether there are any changes to quality during construction is advised.

Treatment and infiltration options are described in further detail in the following sections.

4.4.1 Treatment

According to the Hazardous Materials Technical Memorandum[15], multiple releases of many different contaminants have occurred across the site at different times in recent history. It is likely that pollutants found in the groundwater would include metals, diesel fuel (historic spill at Bowdoin Station), and polycyclic aromatic hydrocarbons, that would require carbon and/or sand filtration treatment. These releases have contaminated the shallow groundwater locally. Based on the close proximity of the release sites to proposed excavation areas, shallow groundwater pumped from the excavation areas will likely need to be treated before it can be released to a storm drain or into an infiltration trench. A typical treatment method would be to settle out solids in a fractionation tank, then route the water (by pumping) through activated carbon before releasing it. Treatment options will be limited by siting constraints.

4.4.2 Infiltration

As described in the Groundwater Management Plan[16], the Charles Circle area is comprised of many buildings that are supported on timber piles. The water table in this area is currently depressed and many of the timber pile supported buildings in this area, which have not already been underpinned, are at risk of subsidence. This portion of the project area is subject to the City of Boston Groundwater Conservation Overlay District (GCOD) regulations, which require certification by a Massachusetts Licensed Professional Engineer that the proposed construction will not lower groundwater levels at properties within the GCOD. Although the GCOD recharge

[15] Massachusetts Department of Transportation. *Hazardous Materials Inspection Technical Memorandum*. September 2009.

[16] Massachusetts Department of Transportation. *Groundwater Management Plan*. October 2009.

requirements are primarily targeted towards impervious surfaces, the project may be subject to these requirements due to additional dewatering.

The most feasible infiltration option to be explored in the project area during construction and port-construction (see Section 5) includes the use of infiltration trenches in affected areas. This excavated trench would be lined and backfilled with stone to form a subsurface basin. Groundwater and stormwater collected in the mined tunnel would be diverted into the trench and stored until it can infiltrate into the soil. Infiltration trenches are very adaptable Best Management Practices (BMPs), and the availability of many practical configurations make it ideal for small urban drainage areas, such as the Cambridge Street corridor[17]. The trenches can be either on-line or off-line systems.

[17] U.S. Department of Transportation Federal Highway Administration. *Stormwater Best Management Practices in an Ultra-Urban Setting: Selection and Monitoring.* (http://www.fhwa.dot.gov/environment/ultraurb/index.htm)

5

Post-Construction Management

Given the urban character of the project area, proposed changes under the Build Alternatives would occur on existing developed land rather than undisturbed sites. No new impervious surfaces are proposed, which eliminates the potential for new stormwater-related impairment to the Charles River.

Post-construction stormwater management infrastructure will mirror the existing system. Preliminary design of the Build Alternatives does not include any long-term alternations to the BWSC drainage system or increased impervious surfaces.

Groundwater dewatering on a permanent basis may be required depending on the permeability of the tunnel. Groundwater monitoring will be conducted throughout the construction period to determine this need and the potential volume of groundwater to be treated and either discharged or infiltrated.

5.1 Stormwater Management

No long-term alterations to the existing drainage system are proposed. As discussed in Section 1, the BWSC stormwater drainage system combines with the MWRA sanitary sewer system for treatment at the Deer Island Treatment Plant. Therefore, there are no on-site stormwater management facilities. Existing stormwater management practices conducted by BWSC will continue, including:

- Regular Street Sweeping;
- Inspect and Maintain Outfall Structures;
- Inspect and Clean Catch Basins;
- Snow and Ice Removal;
- Routine Trash/Litter Clean-up.

5.1.1 Street Sweeping Program

The City if Boston currently maintains a daily street sweeping schedule for long-term pollutant and sediment control. Pollutants, including sediment, debris, trash, road salt, and trace metals can be minimized by street sweeping. The City's cleaning occurs daily (a bi-monthly schedule covers each neighborhood) from April through November by contracted and City-owned mechanical sweepers. Nightly street sweeping along Cambridge Street during project construction could be negotiated through an agreement with MassDOT and the City of Boston.

5.1.2 Catch Basin Cleaning Program

Typical BWSC maintenance of a catch basin includes removing trash and sediments collected in the sump using a catch basin cleaner with a clamshell bucket or a vactor truck. It is recommended that sediment is removed at least once per year or whenever greater than six inches of sediment has accumulated. Additional general maintenance activities are performed whenever necessary including repairs to the catch basin's brickwork, frames, covers, and hoods/traps. BWSC has incorporated a computerized work order management system to track cleaning and maintenance activities performed on its catch basins. Information is collected in the work system including the date of cleaning or maintenance repair; amount of sediment removed; and the nature of repair.

5.1.3 Snow and Ice Removal

Snow removal along Cambridge Street should be managed using DEP's 2001 Snow Disposal Guidance. The guidance provides snow disposal site selection, site preparation and maintenance, and emergency snow disposal procedures for government agencies and private businesses that are acceptable to DEP to ensure that the MA Water Quality Standards are met. It is recommended that snow is not stockpiled on pavement surfaces, storm drain catch basins, or in stormwater drainage swales or ditches. A high volume of sand, sediment, and litter released from melting snow also may be quickly transported through the system into surface water. U.S. EPA SWPPP guidance recommends that application rates of deicing materials should be monitored and reduced accordingly.

5.2 Groundwater Dewatering

Post-construction dewatering has not been proposed at this level of design. However, post-construction groundwater monitoring will be conducted to determine whether leakage into the tunnel is sufficiently small enough not to affect the water table. The construction contractor should be required to take remedial measures if monitoring data indicate that the tunnel construction is lowering the water table. If

required, post-construction dewatering practices would be identical to those proposed during construction, including treatment and infiltration.

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6

Regulatory Compliance

The proposed project meets the Massachusetts Stormwater Management Standards because there will be no additional impervious surfaces and no additional stormwater discharges to the receiving water. Temporary alterations to the drainage system will meet the Massachusetts Stormwater Management Standards and U.S. Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) requirements for construction activities disturbing more than one acre. The new system would be designed to meet the Massachusetts Stormwater Management Standards. Coverage under the EPA NPDES Construction General Permit is required because the project disturbs over an acre of land. As discussed previously, this permit requires a SWPPP to address erosion and sediment control during construction.

The project will require the following permits and must meet associated regulatory standards:

- Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) Construction General Permit (EPA, Federal Register, December 8, 1999 and amendments);
- Authorization under the BWSC NPDES Permit for Discharges to the Stormdrain (NPDES Permit No. MA0101192) ;
- EPA Remediation General Permit (EPA, Federal Register, September 9, 2005); and
- Massachusetts Stormwater Management Standards and Regulations (Department of Environmental Protection February 2008).

Compliance with these regulations is described in the following sections.

6.1 NPDES Construction General Permit

The proposed project will result in the disturbance of more than one acre of land and thus requires the preparation and implementation of a Stormwater Pollution Prevention Plan (SWPPP) by the site contractor and owner in accordance with the CGP. The SWPPP is not included in this report. However, standard recommended components of the Stormwater Pollution Prevention Plan for construction phases of the development to be prepared and implemented by the site contractor have been described in Section 5.

6.2 Authorization Under BWSC NPDES Permit

The proposed project may result in discharges to the existing BWSC stormdrain system. The BWSC is authorized to discharge stormwater from the CSO system to the Charles River under their NPDES Permit (No. MA0101192). The project contractor must receive authorization from BWSC for coverage under this permit. BWSC has also promulgated *Regulations Governing the Use of Sanitary and Combined Sewers and Storm Drains* that the project must comply with. The following applications and permits are required by these Regulations and issued by BWSC as they apply:

- Permit to Enter Commission Sewers;
- General Service Application;
- Termination Verification Approval Application;
- Drainage Discharge Permit and/or Dewatering Discharge Permit; and
- Sewer Use Discharge Permit (issued jointly with MWRA).

The Regulations state that discharge of dewatered groundwater onto the CSO system is prohibited except "as authorized in writing by the Commission and the MWRA when the discharger has taken all reasonable efforts to eliminate and minimize the flow, there is no reasonable access to a storm drain, surface water, or another disposal alternative, and the amount to be discharged will not have an actual or potential adverse impact on the sewer system, the quality of receiving water, or the Commission's ability to meet its obligations under any law, regulation, permit, or order.[18] The project proposes to discharge to the stormdrain system however, if discharges to the CSO system are deemed necessary, the impacts to receiving waters

[18] Boston Water and Sewer Commission. *Regulations Governing the Use of Sanitary and Combined Sewers and Storm Drains.* August 1998.

would be mitigated through treatment, infiltration of partial flows, and outlet erosion control measures, as described in Section 4.

6.3 NPDES Remediation General Permit

The proposed project requires a Remediation General Permit (RGP) because dewatered groundwater will need to be managed as it is impacted with Oil and/or Hazardous Materials and thus requires the preparation of a Notice of Intent by the site contractor and owner to seek coverage to discharge in accordance with the Environmental Protection Agency's (EPA's) National Pollutant Discharge Elimination System (NPDES) Remediation General Permit.

6.4 Massachusetts Stormwater Management Standards

Although the project work areas are not located within Wetlands Protection Act (WPA) jurisdiction, the MEPA Certificate required that the Stormwater Management Plan evaluate the project's compliance with the Massachusetts Stormwater Management Standards. MassDOT does not anticipate the need for a WPA or Massachusetts 401 Water Quality Certification permit. The methods for compliance with the ten stormwater performance standards developed by the MA DEP are summarized below.

1. ***No new stormwater conveyances may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.***

   No new stormwater conveyances would be created by the No-Build or Build Alternatives. Dewatered groundwater would be treated prior to discharge into the existing stormwater management system, if not first infiltrated. Standard 1 also states the existing outfalls "shall be brought into compliance with Standard 1 to the maximum extent practicable." Outlet protective/velocity dissipation enhancements to the existing MWR 022 CSO outfall have been proposed.

2. ***Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.***

   No changes to existing peak discharge rates are proposed under the No-Build or Build Alternatives.

3. ***Loss of annual recharge to ground water shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site***

design, low impact development techniques, stormwater best management practices, and good operation and maintenance.

Preliminary designs anticipate no changes to the post-construction recharge rates within the project area. Infiltration of dewatered groundwater is proposed, as discussed in Section 4.

4. ***Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).***

   No changes to the existing stormwater management system are proposed by the No-Build or Build Alternatives. However, the SWPPP will include measures to control pollution sources through street sweeping and other measures described in Section 4.

5. ***For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable***

   Not applicable.

6. ***Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas as provided in the Massachusetts Stormwater Handbook.***

   Not applicable.

7. ***A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6.***

   The project will meet Standards 1, 2, 3 and the pretreatment and BMP requirements of Standard 4, as described above.

8. ***A plan to control construction related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.***

Recommended erosion and sedimentation control practices are briefly described in Section 4 and will be finalized in the project SWPPP. A maintenance checklist recommended for evaluating erosion control BMPs will also be included.

9. ***A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.***

   The City of Boston is responsible for the long-term operation and maintenance of the stormwater management system along Cambridge Street.

10. ***All illicit discharges to the stormwater management system are prohibited.***

    Not applicable.

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Figures

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